

REVISION OF THE SUBFAMILY CARDIOCHILINAE (HYMENOPTERA:
BRACONIDAE) IN CHINA. I. THE GENERA *AUSTEROCARDIOCHILES*
DANGERFIELD, AUSTIN, AND WHITFIELD, *EURycARDIOCHILES*
DANGERFIELD, AUSTIN, AND WHITFIELD AND
PSILOMMISCUS ENDERLEIN

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Abstract.—An illustrated key to the six genera of the Cardiochilinae known to occur in China is presented, with three genera, *Austerocardiochiles* Dangerfield, Austin, and Whitfield, *Eurycardiochiles* Dangerfield, Austin, and Whitfield and *Psilommiscus* Enderlein, reported for the first time. Three **new species** of *Austerocardiochiles* are described: *A. tujiazu* Chen, Whitfield and He, *A. xibozu* Chen, Whitfield and He, and *A. zhejiangensis* Chen, Whitfield and He. Four species of *Eurycardiochiles* are reported: *E. occidentalis* Dangerfield and Austin, and the **new species** *E. dongzu* Chen, Whitfield and He, *E. shezu* Chen, Whitfield and He, and *E. jiulong* Chen, Whitfield and He. *Psilommiscus* is new to China, represented only by *P. sumatranus* Enderlein. *Austerocardiochiles japonicus* (Watanabe), **new combination**, and *A. turga* (Belokobylskij), **new combination**, are transferred from *Cardiochiles* Nees.

Key Words: Braconidae, Cardiochilinae, *Austerocardiochiles*, *Eurycardiochiles*, *Psilommiscus*, new species, new records, China

The subfamily Cardiochilinae is a small, well-established subfamily in the family Braconidae (Quicke and van Achterberg 1990, Whitfield and Mason 1994, Whitfield and Dangerfield 1997, Dangerfield et al. 1999, Mercado and Wharton 2003). The knowledge of its biology is mostly restricted to a few commonly studied species of *Cardiochiles* Nees *s.s.* and *Toxoneuron* Say, particularly *T. nigriceps* (Viereck). Cardiochilinae are endoparasitoids of lepidopteran larvae of the families Apatelodidae, Cosmopterigidae, Gelechiidae, Pyralidae, Noctuidae and Uraniidae, some of which are major pests of agricultural crops and forests (Huddleston and Walker 1988). The species appear to be most diverse and abundant in

temperate grasslands and tropical forests, especially seasonally dry forests.

The Cardiochilinae contain 16 extant genera worldwide according to the new generic classification of this subfamily based on a phylogenetic analysis of qualitative and morphometric characters carried out by Dangerfield et al. (1999). The subfamily is cosmopolitan in distribution, while individual genera are sometimes restricted to individual hemispheres or continents (Table 1). Several of the sixteen genera have been redefined recently (Mercado and Wharton 2003), and it is likely that the generic total will continue to change for some time. Dolphin and Quicke (2001) have estimated a total diversity of from 187 to 283 world

Table 1. World genera of Cardiochilinae with their known distributions and their occurrence in China.

Genus	Known Distribution	Recorded from China
<i>Asiacardiochiles</i> Telenga	Palearctic, Australian Regions	No
<i>Austero-cardiochiles</i> Dang., Aust., and Whitf.	Palearctic, Oriental, Afrotropical, Australian	This paper
<i>Boltayella</i> Belolobyl'skij	All regions except Neotropical	No
<i>Cardiochiles</i> Nees	Cosmopolitan	Kokoujev, 1895; Szepliget, 1902; Enderlein, 1906; Chou, 1995
<i>Eurycardiochiles</i> Dang., Aust., and Whitf.	Oriental, Palearctic Regions	This paper
<i>Gwemia</i> Dang., Aust., and Whitf.	Australian Region	No
<i>Hausonia</i> Dangerfield	Neotropical Region	No
<i>Hartemita</i> Cameron	Oriental Region	Dangerfield & Austin, 1990; Chen, He and Ma (1998)
<i>Heteropteron</i> Brullé	Neotropical Region	No
<i>Hymenicis</i> Dang., Aust., and Whitf.	Australian Region	No
<i>Latitergum</i> Dang., Aust., and Whitf.	Australian Region	No
<i>Pseudocardiochilus</i> Hedwig	Palearctic, Australian Regions	No
<i>Psilommiscus</i> Enderlein	Oriental Region	This paper
<i>Retnisigaster</i> Dang., Aust., and Whitf.	Holarctic Region	No
<i>Schoenlandella</i> Cameron	Cosmopolitan	Enderlein, 1906; Chou, 1995
<i>Toxoneuron</i> Say	Afrotropical, Nearctic, Neotropical Regions	No

cardiochiline species, using different estimation methods. There are just under 200 described species at present (Dangerfield et al. 1999, Mercado and Wharton 2003); however, there are large numbers of undescribed species, particularly from south-eastern Asia, Africa, and Central and South America where the subfamily has not been studied comprehensively. For example, Mercado and Wharton (2003) recognize 45 species from Mexico where only 28 are currently described, even after their study. Thus the Dolphin and Quicke (2001) estimates are likely somewhat low.

The Chinese fauna of Cardicochilinae is among the most sparsely studied in the world, only the species of *Hartemita* Cameron having been revised (Chen et al. 1998). This paper is the first to more broadly revise the Chinese Cardiochilinae. Previously, three genera, i.e., *Cardiochiles* Nees s. str., *Hartemita* Cameron, and *Schoenlandella* Cameron were recorded from China, but revision of the large genera *Cardiochiles* s.s. and *Schoenlandella* Cameron from China still remains. *Austerocardiochiles* Dangerfield, Austin, and Whitfield, *Eurycardiochiles* Dangerfield, Austin, and Whitfield and *Psilommiscus* Enderlein are reported and described here for the first time from China. Based on their presently recorded distributions, *Asiacardiochiles* Telenaga, *Bohayella* Belolobyskij and *Pseudocardiochilus* Hedwig are also likely to occur in China, but we have not seen Chinese specimens of them.

The number of specimens available for the taxa treated here is low. XC and JH have examined the following collections: Zoological Research Institute (Beijing); Entomological Research Institute (Shanghai) of the Chinese Academy of Sciences; Fujian Agricultural University (Fuzhou); Shaanxi Agricultural University (Xi'an, one of the largest insect collections in China); China Agricultural University (Beijing); Nanjing Agricultural University (Nanjing); Huanan Agricultural University (Guangzhou); Guizhou University (Guiyang); and

Zhejiang University (the largest parasitic wasp collection in China). They found about 2,200 specimens of Cardiochilinae, the vast majority of them belonging to *Cardiochiles*, *Schoenlandella*, and *Hartemita*. For example, as many as 125 specimens of one species, *Cardiochiles fuscipennis* Szeplogi, were found in the Zhejiang University collection. Thus, the small numbers of specimens of the taxa treated here indicate that these genera and their species are not very abundant in China, at least compared to the three large genera, rather than that almost no material of Cardiochilinae has been sampled.

For the identification of extralimital genera of Cardiochilinae and most of the morphological terminology used in this paper, see Dangerfield et al. (1999). POL:OD:OOL refers to the three-way ratio of the distance between the inner edges of the posterior ocelli (POL) to the diameter of a posterior ocellus (OD) and to the distance between the outer edge of a posterior ocellus and its corresponding compound eye (OOL). Wing vein terminology follows Achterberg (1993). Voucher and type specimens are deposited in the Hymenoptera Collection, Zhejiang University, Hangzhou, China.

KEY TO THE CHINESE GENERA OF THE SUBFAMILY CARDIOCHILINAE

- 1. Ovipositor and sheaths very short, less than 0.2 times hind tibia, stout and sharply down-turned; propodeal areola reduced anteriorly; hind basitarsus laminate . . . *Hartemita* Cameron
- Ovipositor and sheaths much longer, not as stout, only weakly down-turned to straight at apex; propodeal areola complete; hind basitarsus rounded or oval in cross-section (sometimes distinctly compressed but never strongly laminate) 2
- 2. T1 and latero-tergites with lateral suture clearly defined throughout; hypopygium pointed at apex with medial longitudinal area desclerotized and folded inwards
 . . . *Austerocardiochiles* Dangerfield, Austin, and Whitfield
- T1 with lateral suture reduced, poorly defined particularly in apical half; hypopygium variable 3

3. 3r in fore wing virtually always present as a spectral trace, if apparently absent then mouthparts elongate; glossa usually moderately elongate and deeply bilobed at apex; galea mostly long, narrow and bladelike
 *Schoenlandella* Cameron
- 3r in fore wing absent; glossa variable; galea never bladelike, usually short and, if moderately long, then broad 4
4. Hypopygium with medial longitudinal desclerotized and membranous area; galea long and broad, most clearly visible past mandible (glossa sometimes moderately long)
 *Cardiochiles* Nees
- Hypopygium evenly sclerotized throughout, sometimes partially desclerotized and folded inwards, but never membranous; galea short and either narrow or broad 5
5. Eye setae reduced to minute interommatidial spines; scutellum with apical cuplike pit
 *Psilommiscus* Enderlein
- Eye with conspicuous pilosity; apex of scutellum without cuplike pit
Eurycardiochiles Dangerfield, Austin, and Whitfield

Austerocardiachiles Dangerfield, Austin, and Whitfield, 1999

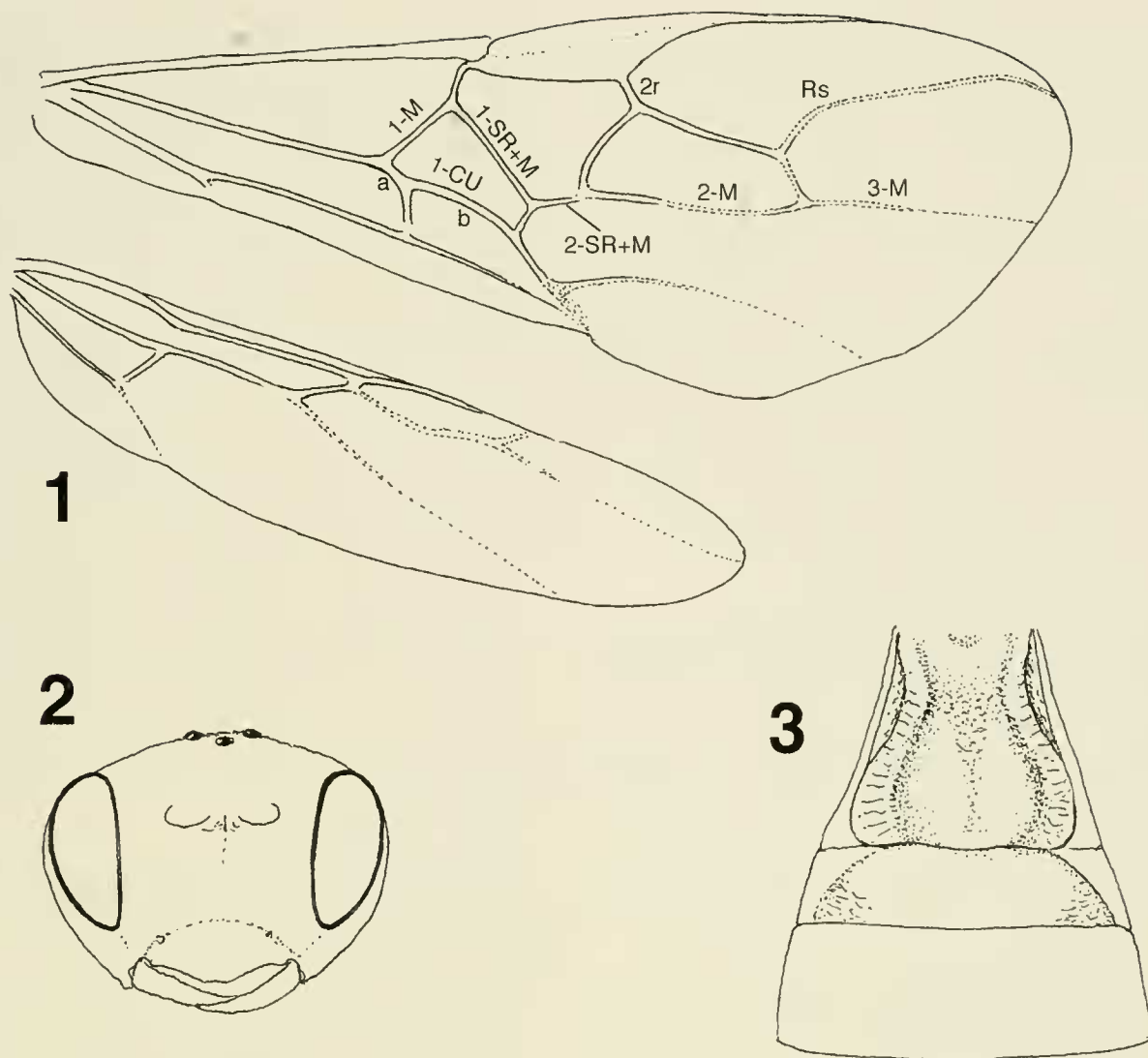
Austerocardiachiles Dangerfield, Austin, and Whitfield 1999: 929. Type species (by original designation): *Cardiochiles pollinator* Dangerfield and Austin.

The genus was proposed by Dangerfield et al. (1999) to include eight described species. Two additional described species, *Cardiochiles japonicus* (Watanabe), **n. comb.** (Japan) and *C. turga* (Belokobylskij), **n. comb.** (Russian Far East) are transferred into this genus (following Belokobylskij, personal communication). The number of species in this genus accounts for about 5% of the described cardiochiline species. It is widely distributed in the Old World, being recorded from Australia, Philippines, Laos, Japan, Russia, Africa, and now China, but most species occur in the Southern Hemisphere. The species known from Philippines and Laos are currently undescribed. The biology of this genus is unknown, but *A. enderleini* (Szepliget) has been collected from crops of sweet potato (*Ipomaea* sp.) in Kenya.

Austerocardiachiles species have the occipital carina present in the postgenal region, a longitudinal carina set in a furrow on the medial scutum, and epicnemial carina developed (except for *A. tujiazu*, n. sp.), while the medial hypopygium shows variable stages of longitudinal desclerotization among species. *Austerocardiachiles* is, in the analyses of Dangerfield et al. (1999), the sister group to *Cardiochiles* s. str. on the basis of the putative synapomorphy of the hypopygium being medially desclerotized (see Austin 1990 and Dangerfield et al. 1999 for a discussion of the polarity of this feature). It also has the lateral sutures of T1 defined and percurrent, a character also found, apparently independently, in *Hansonia* and *Heteropteron* (Dangerfield et al. 1999).

KEY TO THE CHINESE SPECIES OF
AUSTEROCARDIOCHILES

1. T1 short, distinctly widened apically, 0.9 times as long as broad (Fig. 3); T2 punctate; wing membrane largely distinctly brown; clypeal tubercles obsolescent (Fig. 2); epicnemial carina absent; posterior cuplike pit of scutellum obvious; scutellar sulcus wide, 3.2 times as broad as long; hind basitarsus almost cylindrical; Rs bent in basal 0.20, straight to subapex, then curved downwards to apex (Fig. 1); hind wing with six hamuli; body large, approx. 9–10 mm *A. tujiazu* n. sp.
- T1 longer, hardly widened apically, 1.4–2.0 times longer than broad (Figs. 5, 8); T2 smooth; wing membrane distinctly brown only at apical 1/3; clypeal tubercles distinct (Figs. 6, 9); epicnemial carina present; posterior cuplike pit of scutellum absent; scutellar sulcus narrow, 4.4–4.5 times as broad as long; hind basitarsus distinctly compressed; Rs bent in basal 0.24–0.25, then straight to apex (Figs. 4, 7); hind wing with five hamuli; body smaller, approx 5–7 mm 2
2. Rs of fore wing evenly curved basally (Fig. 4); discal cell of fore wing 2.1 times longer than wide; T1 2.0 times longer than broad, bulb slightly convex and less rugose (Fig. 5); middle lobe of T1 with a fine longitudinal carina in its longitudinal groove *A. xibozu*, n. sp.
- Rs of fore wing angularly bent basally (Fig. 7); discal cell of fore wing 1.7 times longer than wide; T1 1.4 times longer than broad, bulb distinctly convex and distinctly rugose (Fig. 6);



Figs. 1-3. *Austerocardiochiles tujiazu*. 1, Wings. 2, Head, dorsal view. 3, First to third metasomal tergites.

middle lobe of T1 with a more prominent longitudinal carina in its longitudinal groove; . . .
 *A. zhejiangensis*, n. sp.

***Austerocardiochiles tujiazu* Chen,
 Whitfield, and He, new species**
 (Figs. 1-3)

Female.—Body length 9.8 mm, fore wing length 8.8 mm. *Head*: Eyes with moderately dense fine pilosity; head distinctly sculptured with dense long pilosity; labio-maxillary complex just visible below mandible; malar suture present; epistomal suture reduced but visible; clypeal margin convex laterally, with straight medio-lateral part and convex medial part with two obsolescent tubercles; clypeus convex and distinctly rugo-punctate, broad, 2.6 times as broad as high; face 2.0 times as broad as high, distinctly convex, transversely rugose, with medial dorsal node and irregular lon-

gitudinal carina indicated; frons distinctly concave, transversely carinate, with smooth medial carina; length of eye equal to length of temple in dorsal view; POL:OD:OOL = 7:6:21; vertex not raised behind ocelli, narrow, transversely rugose; depth of occiput in dorsal view 0.37 times length of head; antenna with 41(+) segments, short, robust, scape 1.4 times as long as broad; distance between antennal sockets equal to width of antennal socket.

Mesosoma: Side of pronotum distinctly longitudinally rugo-striate ventrally, rest rugo-striate, dorso-medial longitudinal furrow crenulate; notauli present, distinctly crenulate, of even width, meeting posteriorly; scutum distinctly punctate, middle lobe with a fine longitudinal carina in its longitudinal groove; parapsidal grooves present; scutellum sparsely pilose, coarsely

rugose, 1.3 times as broad as long, lateral carinae distinct, posterior cuplike pit obvious; scutellar sulcus wide, 3.2 times as broad as long, with four carinae; dorsellum with medial longitudinal carina weakly defined; propodeal areola lens-shaped, 0.51 times as broad as long, propodeal spiracles elliptical, 2.2 times as long as broad; propodeum short, distinctly rugose; epicnemial carina absent; sternaulus distinct, broad, anteriorly crenulate, posteriorly nearly smooth; mesopleuron glabrous medially above sternaulus, below it foveate-rugose; metapleuron coarsely rugose.

Legs: Fore tibial spur 0.85 times as long as basitarsus; hind tibia expanded slightly at apex, 3.0 times as wide as at base; hind tibia and tarsus with brown spines among pilosity; inner hind tibial spur 1.4 times as long as outer spur, 0.7 times as long as basitarsus; hind basitarsus almost cylindrical with flattened dorsal ridge at base; tarsal claws pectinate, hind claw with six teeth.

Wings: Fore wing pilosity sparse at base, becoming thicker towards apex; stigma 4.0 times as long as wide; Rs bent in basal 0.2, straight to subapex, then curved downwards to apex; 1-SR+M 3.3 times as long as m-cu; 2-SR+M 1.7 times as long as m-cu; 1-M straight; m-cu 0.4 times as long as 1-M; 1-M 0.74 times as long as 1-SR+M; apical $\frac{3}{4}$ of 2-M and 3-M spectral; discal cell 1.5 times as long as wide; 2cu-a represented by pigmented area; 1a present, spectral in whole length; 1-2A+3A spectral, reaching to 1a; 1-CUa 0.27 times as long as 1-CUb; 2r 0.54 times inside height of second submarginal cell, arising 0.6 times length along stigma; second submarginal cell 2.4 times as long as wide; 2+3-SR slightly arched near 2-M; hind wing with six evenly spaced hamuli; 2-1A and 2A absent; 2-SC+R vertical; r present, spectral.

Metasoma: T1 short, distinctly widened apically, 0.9 times as long as broad, stem 0.3 times as long as bulb; bulb convex but medio-longitudinally concave, distinctly coarsely rugose; suture between T2 and T3 represented by well-defined groove; median field of T2 0.35 times as long as wide; T2 punctate; ovipositor sheaths broad and long, 0.55 times as long as hind tibia, 0.27 times as broad as long, densely hairy along length, broadening to and rounded at apex with dorsal notch; hypopygium with sparse fine hairs, hairless at apex, rounded and acutely angled at apex, largely sclerotised except medially slightly desclerotized with sclerotized bridge apically and basally.

Color: Black, fore tibia, tarsus and apex of fore femur orange; wing membrane distinctly brown, basally paler, stigma and veins dark brown.

Male.—Unknown.

Material examined.—Holotype ♀, China: Hubei, Shiniandachuan, 1986.viii.2, Mao Xiaoyuan, no.870217.

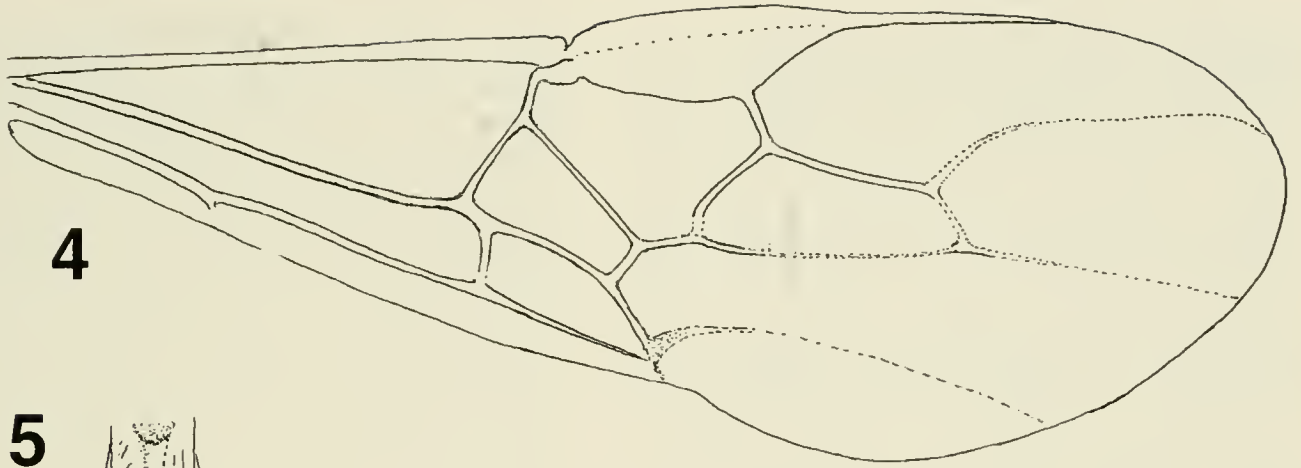
Note.—This species is similar to *A. xibozu* and *A. zhejiangensis*, but can be separated from them by the characters listed in the key. From the type species, this species (as do the other two Chinese species below) has a broader and more apically rounded first metasomal tergite.

Etymology.—This species is named after one of the Chinese minorities, Tujia Zu, who live mainly in Hubei and Hunan provinces.

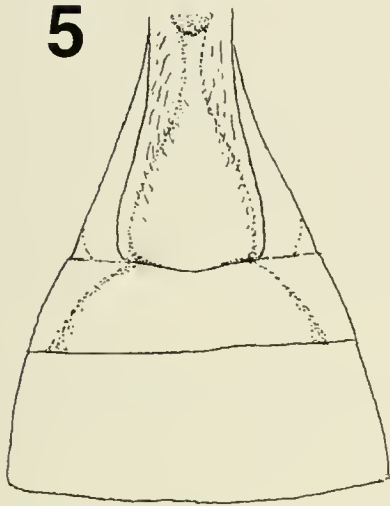
***Austerocardiochiles xibozu* Chen,
Whitfield, and He, new species**
(Figs. 4–6)

Female.—Body length 5.6 mm, fore wing length 5.4 mm. *Head:* Eyes with moderately dense fine pilosity; head distinctly sculptured with dense long pilosity; labio-

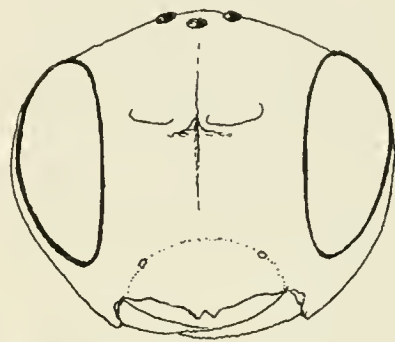
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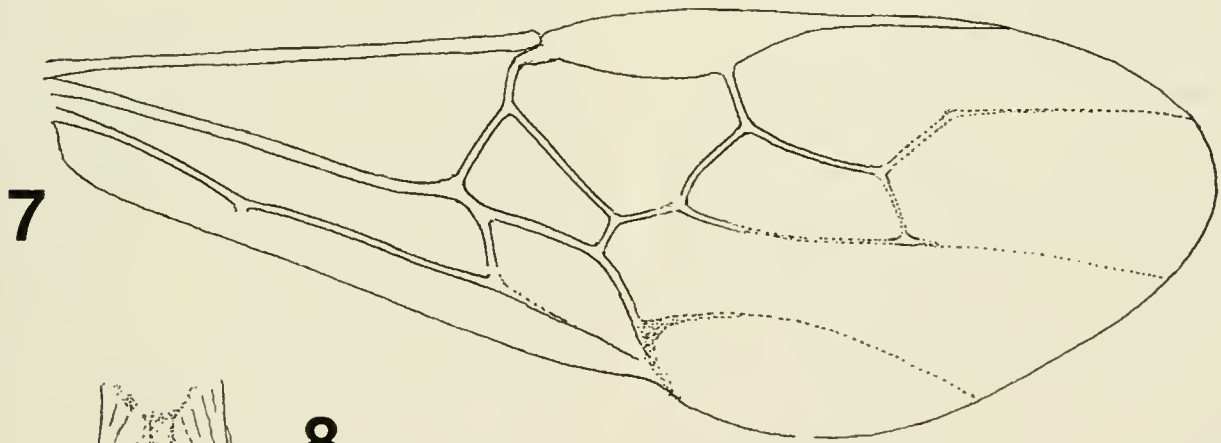
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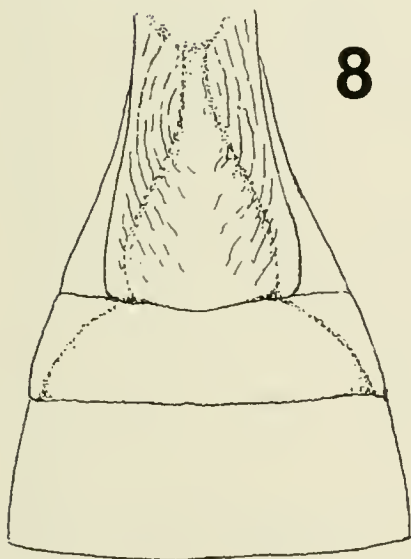
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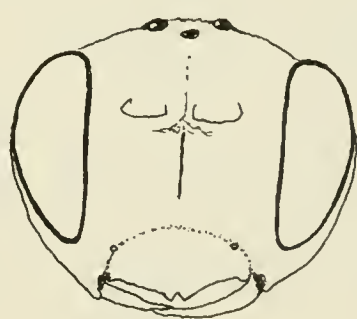
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maxillary complex just visible below mandible; malar suture present; epistomal suture reduced medially; clypeal margin convex laterally, with straight medio-lateral part and convex medial part with two distinct tubercles; clypeus convex and distinctly rugo-punctate, broad, 2.1 times as broad as high; face 1.7 times as broad as high, distinctly convex, transversely rugose, with an obvious longitudinal carina; frons distinctly concave, transversely finely rugose, with a medial carina; length of eye 1.3 times as long as length of temple in dorsal view; POL:OD:OOL = 9:6:17; vertex not raised behind ocelli, narrow, transversely rugose; depth of occiput in dorsal view 0.52 times length of head; antenna with 39 segments, short, robust, scape distinctly punctate, 1.8 times as long as broad; distance between antennal sockets about equal to width of antennal socket.

Mesosoma: Side of pronotum coarsely longitudinally rugo-striate ventrally, rest rugo-striate, dorso-medial longitudinal furrow crenulate anteriorly; notauli present, distinctly crenulate, of even width, meeting posteriorly; scutum distinctly rugose, middle lobe with a fine longitudinal carina in its longitudinal groove; parapsidal grooves present; scutellum sparsely pilose, coarsely rugose, 1.5 times as broad as long, lateral carinae distinct, without posterior cuplike pit; scutellar sulcus narrow, 4.4 times as broad as long, with four strong carinae; propodeal areola lens-shaped, 0.55 times as broad as long, propodeal spiracles elliptical, 2.5 times as long as broad; propodeum short, distinctly rugose; epicnemial carina present, distinctly ventrally; sternaulus distinct, broad, anteriorly crenulate, posteriorly nearly smooth; mesopleuron glabrous medially above sternaulus, below sternaulus striate-rugose; metapleuron coarsely rugose.

Legs: Fore tibial spur 0.9 times as long as basitarsus; hind tibia expanded slightly at apex, 3.0 times as wide as at base; hind tibia and tarsus with brown spines among pilosity; inner hind tibial spur 1.6 times as

long as outer spur, 0.66 times as long as basitarsus; hind basitarsus compressed with flattened dorsal ridge at base; tarsal claws pectinate, hind claw with seven teeth.

Wings: Fore wing pilosity sparse at base, becoming thicker towards apex; stigma 3.4 times as long as wide; Rs bent in basal 0.25, straight to near apex, then slightly curved downwards to apex; 1-SR+M 3.6 times as long as m-cu; 2-SR+M 1.5 times as long as m-cu; 1-M straight; m-cu 0.4 times as long as 1-M; 1-M 0.7 times as long as 1-SR+M; apical $\frac{3}{4}$ of 2-M and 3-M spectral; discal cell 2.1 times as long as wide; 2cu-a represented by pigmented area; 1a present, spectral in whole length; 1-2A+3A spectral, reaching 1a; 1-CUa 0.32 times as long as 1-CUb; 2r 0.67 times inside height of second submarginal cell, arising 0.6 times length along stigma; second submarginal cell 2.6 times as long as wide; 2+3-SR slightly arched near 2-M; hind wing with five evenly spaced hamuli; 2-1A and 2A absent; 2-SC+R vertical; r present, spectral.

Metasoma: T1 long, hardly widened apically, 2.0 times as long as broad, stem about 0.33 times as long as bulb; tergite beside stem finely striate, bulb slightly convex, indistinctly rugose, but smooth apically; suture between T2 and T3 represented by well-defined groove; median field of T2 0.31 times as long as wide; T2 smooth; ovipositor sheath broad and long, 0.52 times as long as hind tibia, 0.29 times as broad as long, densely hairy along length, broadening to and rounded at apex with dorsal notch; hypopygium with sparse fine hairs, hairless at apex, rounded and acutely angled at apex, largely sclerotized except medially slightly desclerotized and folded inwards.

Color: Black; antenna and palpi dark brown; fore tibia, tarsus and apex of fore femur orange; tibia and basitarsus of middle leg brown, 2nd–5th tarsi of middle leg brownish yellow, middle and hind tibiae with a yellowish white basal ring; laterotergite of T1 dark reddish brown; wing membrane only brownish on apical $\frac{1}{4}$, rest

hyaline, stigma dark brown, veins brown to dark brown.

Male.—Unknown.

Material examined.—Holotype ♀, China: Jilin, Antu, 1994.viii.5–6, Lou Juxian, no.977083.

Note.—This species is closely similar to *A. rugosus* (Telenga) but can be separated from the latter by T1 longer, 2 times as long as wide, rugose, but smooth apically; eyes with moderately dense and fine pilosity; POL 1.5 times OD; and latero-tergite of first tergite ventrally dark reddish brown.

Etymology.—This species is named after one of the Chinese minorities, Xibo Zu, who live mainly in Jilin and Liaoning provinces.

***Austerocardiophiles zhejiangensis* Chen,
Whitfield, and He, new species**
(Figs. 7–9)

Female.—Body length 6.5 mm, fore wing length 6.1 mm. *Head*: Eyes with dense fine pilosity; head distinctly sculptured with dense long pilosity; labio-maxillary complex just visible below mandible; malar suture present; epistomal suture visible; clypeal margin convex laterally, with straight medio-lateral part and convex medial part with two tubercles; clypeus convex and distinctly rugose, broad, 2.1 times as broad as high; face 1.7 times as broad as high, distinctly convex, coarsely rugose, with strong but fine medio-longitudinal carina; frons distinctly concave, transversely carinate, with smooth medial carina; length of eye 1.3 times as long as temple in dorsal view; POL:OD:OOL = 10:6.5:18; vertex slightly raised behind ocelli, narrow, coarsely rugose; depth of occiput in dorsal view 0.6 times length of head; antenna with 41 segments, short, robust, scape 1.7 times as long as broad; distance between antennal sockets equal to width of antennal socket.

Mesosoma: Side of pronotum coarsely longitudinally striate ventrally, dorso-medial longitudinal furrow coarsely crenulate; notauli present, distinctly crenulate, of even width, meeting posteriorly; scutum distinct-

ly foveate-rugose, middle lobe with a distinct longitudinal carina in its longitudinal groove; parapsidal grooves present; scutellum moderately densely pilose, coarsely rugose, 1.3 times as broad as long, without posterior cuplike pit; scutellar sulcus narrow, 4.5 times as broad as long, with two strong carinae; dorsellum without medial longitudinal carina; propodeal areola lens-shaped, 0.57 times as broad as long, propodeal spiracles elliptical, 2.3 times as long as broad; propodeum short, distinctly rugose; epicnemial carina present, distinctly ventrally; sternaulus distinct, broad, anteriorly crenulate, posteriorly nearly smooth; mesopleuron glabrous medially above sternaulus, below it foveate-rugose; metapleuron coarsely rugose.

Legs: Fore tibial spur 0.9 times as long as basitarsus; hind tibia expanded at apex, 3.1 times as wide as at base, with a longitudinal groove on its outside at apical $\frac{1}{2}$; hind tibia and tarsus with brown spines among pilosity; inner hind tibial spur 1.4 times as long as outer spur, 0.7 times as long as basitarsus; hind basitarsus compressed with flattened dorsal ridge at base; tarsal claws pectinate, hind claw with seven teeth.

Wings: Fore wing pilosity sparse at base, becoming thicker towards apex; stigma 3.7 times as long as wide; Rs angularly bent in basal 0.24, straight to apex; 1-SR+M 4.0 times as long as m-cu; 2-SR+M 1.7 times as long as m-cu; 1-M straight; m-cu 0.4 times as long as 1-M; 1-M 0.63 times as long as 1-SR+M; apical $\frac{3}{4}$ of 2-M and 3-M spectral; discal cell 1.7 times as long as wide; 2cu-a represented by pigmented area; 1a present, spectral in whole length; 1-2A+3A spectral, reaching 1a; 1-CUa 0.37 times as long as 1-CUb; 2r 0.64 times inside height of second submarginal cell, arising 0.68 times length along stigma; second submarginal cell 2.5 times as long as wide; 2+3-SR slightly arched near 2-M; hind wing with five evenly spaced hamuli; 2-1A and 2A absent; 2-SC+R vertical; r present, spectral.

Metasoma: T1 long, hardly widened apically, 1.4 times as long as broad, stem 0.28 times as long as bulb; tergite beside stem longitudinally striate; bulb distinctly convex but medio-longitudinally concave, distinctly coarsely rugose, apically smooth; suture between T2 and T3 represented by well-defined groove; median field of T2 0.33 times as long as wide; T2 smooth; ovipositor sheath broad and long, 0.56 times as long as hind tibia, 0.28 times as broad as long, densely hairy along length, broadening to and rounded at apex with dorsal notch; hypopygium with sparse fine hairs, hairless at apex, rounded and acutely angled at apex, largely sclerotized except medially slightly desclerotized and folded inwards.

Color: Black; antenna and palpi dark brown; fore tibia, tarsus and apex of fore femur orange, middle tarsus brown to dark brown, middle and hind tibiae with a yellowish white basal ring; latero-tergite of T1 dark reddish brown; wing membrane distinctly brown at apical $\frac{1}{3}$, basally hyaline, stigma and veins dark brown.

Variation.—Body length 6.5–7.0 mm, fore wing length 6.1–6.5 mm. Bulb of first tergite convex but medio-longitudinally not concave.

Male.—Unknown.

Material examined.—Holotype ♀, China: Zhejiang, Anjie, Mt. Longwang, 1995.vii.21, Wu Hong, no.970862. Paratype: 1 ♀, China: Zhejiang, Mt. W. Tianmu, 1987.ix.4, Fan Jinjiang, No.876253.

Note.—This species is similar to *A. rugosus* (Telenga), but can be separated from the latter species by having the Rs of fore wing angularly bent in basal 0.24, then straight to apex; bulb of first tergite convex, distinctly coarsely rugose, apically smooth, and sometimes medio-longitudinally concave; and POL longer than OD. It is also similar to *A. xibozu* n. sp., but can be distinguished from the latter by the characters listed in the key.

Etymology.—This species is named after Zhejiang province in China, on the east bor-

der of the Palaearctic and Oriental regions, where this new species occurs.

Eurycardiachiles Dangerfield, Austin, and Whitfield, 1999

Eurycardiachiles Dangerfield, Austin, and Whitfield 1999: 938. Type species (by original designation): *Cardiachiles occidentalis* Dangerfield and Austin.

This genus can be recognized by having an apically strongly broadened ovipositor sheath and a broadened clypeus. It is the sister group to *Schoenlandella* + *Austero-cardiachiles* + *Cardiachiles s. str.*, all of which have antennae of more than 33 segments, and two apical clypeal tubercles. It is known previously from Australia with the type species and Sri Lanka with an undescribed species. The biology of the genus is unknown.

This genus is recorded here for the first time in China and three new species are described below. The Chinese species described here are quite different from the type species in general appearance. The type species has the head and mesosoma largely smooth, and the hypopygium evenly sclerotized while all Chinese species have the head and mesosoma largely sculptured and the hypopygium medio-longitudinally less strongly sclerotized and often folded inwards. For the moment the Chinese species appear to fit best within *Eurycardiachiles*, but eventually may be found to represent a distinct group.

KEY TO SPECIES OF *EURYCARDIOCHILES*

1. Head and mesosoma largely smooth; median field of T2 0.5 times as long as wide; hypopygium evenly sclerotized
 *E. occidentalis* Dangerfield and Austin
- Head and mesosoma largely sculptured; median field of T2 0.28–0.32 times as long as wide; hypopygium medio-longitudinally less sclerotized and folded inwards 2
2. Body smaller, about 5.5 mm; face 1.9 times as broad as high; vein 1-CUa of fore wing 0.33 times vein 1-CUb; first metasomal tergite longer, 1.2 times as long as broad; antenna with 37 segments *E. dongzu*, n. sp.
- Body larger, about 7.8–8.1 mm; face 1.5 times

- as broad as high; vein 1-CUa of fore wing 0.42–0.46 times vein 1-CUb; first metasomal tergite short, as long as broad; antenna with 41–46 segments 3
3. Clypeal margin medially with two distinct tubercles; face with a distinct medio-longitudinal carina; wing membrane entirely evenly brownish; vein m-cu of fore wing 0.4 times vein 1-M; hind claw with eight teeth; hind wing with eight hamuli; and antenna with 46 segments *E. shezu*, n. sp.
- Clypeal tubercles indistinct; medio-longitudinal carina on face much less distinct; wing membrane much less brownish basally; vein m-cu of fore wing 0.5 times vein 1-M; hind claw with nine teeth, hind wing with six hamuli; and antenna with 41 segments
. *E. jiulong*, n. sp.

***Eurycardiophiles dongzu* Chen,
Whitfield, and He, new species**
(Figs. 10–12)

Female.—Body length 5.5 mm, fore wing length 5.3 mm. *Head*: Eyes with dense fine pilosity; head sculptured with moderately dense long pilosity; labio-maxillary complex just visible below mandible; malar suture present; epistomal suture visible; clypeal margin convex laterally, with straight medio-lateral part and convex medial part with two distinct tubercles (Fig. 12); clypeus broad, convex and distinctly rugose, 2.2 times as broad as high; face 1.9 times as broad as high, coarsely transversely rugose, with a weak medio-longitudinal carina; frons transversely striate, with a medial carina reaching near anterior ocellus; vertex not raised behind ocelli, narrow, coarsely transversely striate; depth of occiput in dorsal view 0.53 times length of head; length of eye 1.4 times length of temple in dorsal view; POL:OD:OOL = 9:6:15; antenna with 37 segments, short, thick, scape 1.7 times as long as broad; antennal sockets separated by 0.83 times width of antennal socket.

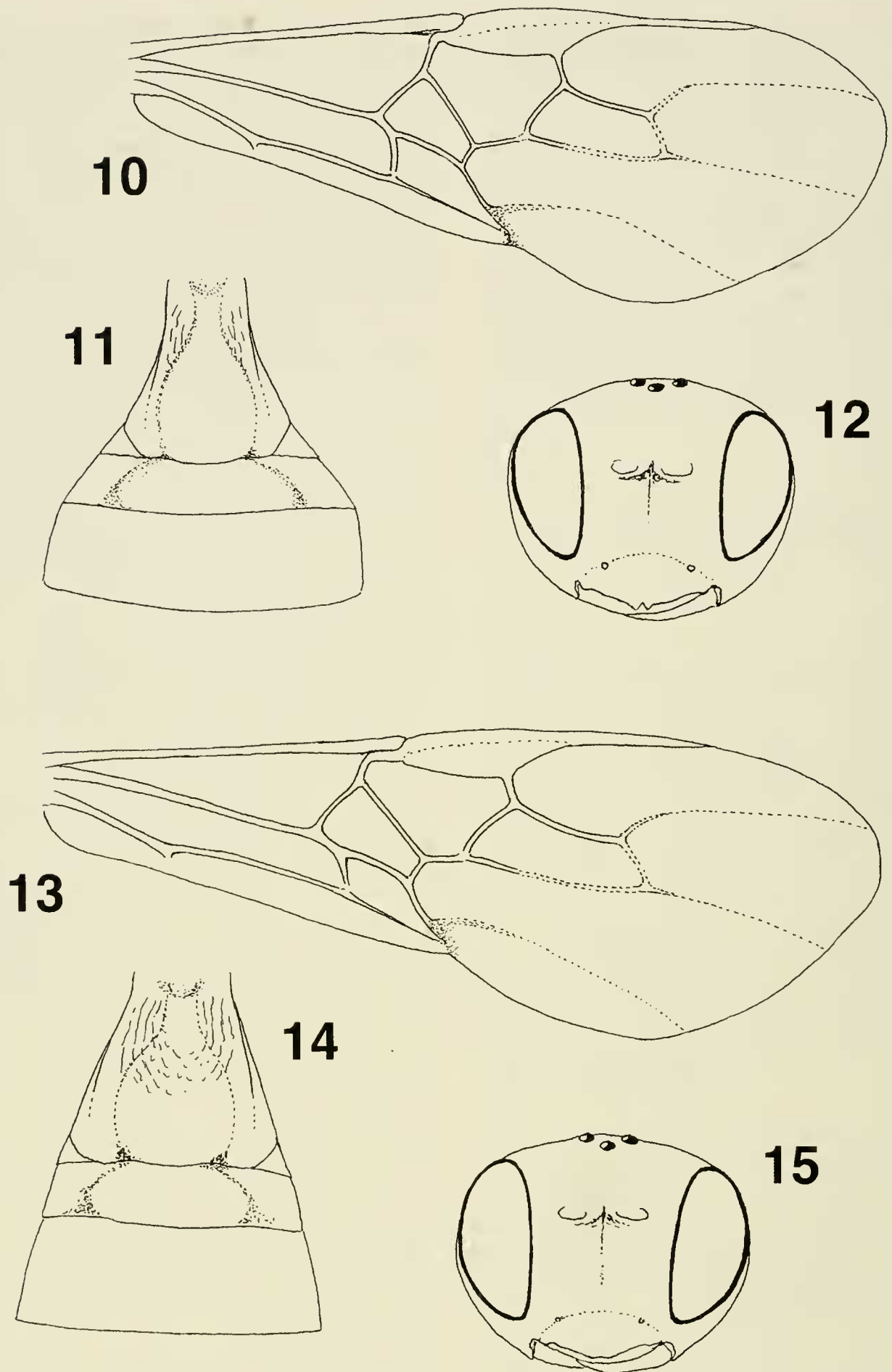
Mesosoma: Side of pronotum coarsely longitudinally striate ventrally, dorso-medial longitudinal furrow coarsely crenulate, rest striate; notauli present, deep, crenulate, of even width, meeting posteriorly; scutum distinctly rugose, a medio-longitudinal ca-

rina present in medio-longitudinal groove; parapsidal grooves present; scutellum with dense long pilosity, coarsely rugose, 1.4 times as broad as long, lateral carinae distinct; scutellar sulcus very narrow, 5.1 times as broad as long, with four carinae; dorsellum with a weak medial longitudinal carina; propodeum short, rugose, with crenulae branching from areola; propodeal areola lens-shaped, 0.57 times as broad as long, propodeal spiracles elliptical, 2.2 times as long as broad; epicnemial carina present; sternaulus broad, coarsely crenulate; mesopleuron smooth and shiny above sternaulus, below sternaulus distinctly reticulate-rugose.

Legs: Fore tibial spur as long as basitarsus; hind tibia expanded at apex, 2.6 times as wide as at base; hind tibia and tarsus with brown spines among pilosity; inner hind tibial spur 1.6 times as long as outer spur, 0.62 times as long as basitarsus; hind basitarsus moderately compressed with flattened dorsal ridge at base; tarsal claws pectinate, hind claw with six teeth.

Wings: Fore wing (Fig. 10) with dense pilosity, much thicker towards apex; stigma 3.2 times as long as wide; 2r 0.43 times inside height of second submarginal cell, arising 0.62 times length along stigma; Rs bent at basal 0.20, then nearly straight to apex; second submarginal cell 2.4 times as long as wide; 2+3-SR slightly arched near 2-M; 1-SR+M 3.7 times as long as m-cu; 2-SR+M 1.8 times as long as m-cu; 1-M straight; m-cu 0.39 times as long as 1-M; 1-M 0.70 times as long as 1-SR+M; discal cell 1.55 times as long as wide; 2cu-a presented by pigmented area; 1a present, spectral in apical two-thirds; 1-2A+3A spectral, reaching to 1a; 1-CUa 0.33 times as long as 1-CUb; hind wing with five evenly spaced hamuli; 2-1A and 2A absent; 1-SRa present but short.

Metasoma: T1 widened apically, 1.2 times as long as broad, stem 0.26 times as long as bulb, tergite beside stem nearly smooth, bulb convex and smooth (Fig. 11); suture between T2 and T3 represented by



Figs. 10-15. 10-12, *Eurycardiochiles dongzu*. 1, Fore wing. 2, First to third metasomal tergites, dorsal view. 3, Head, dorsal view. 13-15, *E. jiu-long*. 13, Fore wing. 14, First to third metasomal tergites, dorsal view. 15, Head, dorsal view.

well-defined groove; median field of T2 0.28 times as long as wide; T2 smooth; ovipositor sheaths broad and long, 0.56 times as long as hind tibia, 0.28 times as broad as long, densely hairy along length, broadening to and rounded at apex with dorsal notch; hypopygium with moderately dense hair laterally, hairless at apex, rounded and acutely angled at apex, evenly sclerotized except for medio-longitudinally less sclerotized and folded inwards.

Color: Black; fore tibia, tarsus and apex of femur, middle tarsus and basal 0.2 of middle tibia, basal 0.2 of hind tibia brownish yellow to orange, first tergite except for stem and bulb dark red; wing membrane brown, paler basally, stigma and veins brown to dark brown.

Male.—Unknown.

Material examined.—Holotype ♀, China: Hunan, Liuyang, 1984.viii.31, collector unknown, no.846373.

Note.—This new species can be easily separated from the type species, *E. occidentalis* by the largely sculptured head and mesosoma; hypopygium medio-longitudinally less sclerotized and folded inwards; median field of T2 more transverse, 0.28 times as long as wide; and hind claw with six teeth.

Etymology.—This species is named after one of the Chinese minorities, Dong Zu, who mainly live in Hunan and Guizhou provinces, and in the Guangxi Autonomous Administration Region.

***Eurycardiochiles jiulong* Chen,
Whitfield, and He, new species**

(Figs. 13–15)

Female.—Body length 7.8 mm, fore wing length 7.8 mm. *Head:* Eyes with dense fine pilosity; head sculptured with moderately dense long pilosity; labio-maxillary complex just visible below mandible; malar suture present; epistomal suture visible; clypeal margin convex laterally, then evenly convex medially with two very faint tubercles (Fig. 15); clypeus broad, convex and distinctly rugose, 2.2 times as broad as high; face 1.5 times as broad as high,

coarsely transversely rugose, with a fine medio-longitudinal carina; frons transversely striate, with a medial carina reaching to anterior ocellus; vertex not raised behind ocelli, narrow, coarsely transversely striate; depth of occiput in dorsal view 0.58 times length of head; length of eye 1.3 times length of temple in dorsal view; POL:OD:OOL = 10:6.5:21; antenna with 41 segments, short, thick, scape 2.0 times as long as broad; antennal sockets separated by 0.9 times width of antennal socket.

Mesosoma: Side of pronotum coarsely longitudinally striate ventrally, dorso-medial longitudinal furrow coarsely rugose, rest striate; notauli present, deep, crenulate, of even width, meeting posteriorly; scutum distinctly rugose, a medio-longitudinal carina present in medio-longitudinal groove; parapsidal grooves present; scutellum with dense long pilosity, coarsely rugose, 1.3 times as broad as long, lateral carinae distinct; scutellar sulcus narrow, 3.6 times as broad as long, with three carinae; dorsellum with a fine medial longitudinal carina; propodeum short, rugose, with crenulae branching from areola; propodeal areola lens-shaped, 0.47 times as broad as long, propodeal spiracles elliptical, 2.2 times as long as broad; epicnemial carina present ventrally; sternaulus shallow, broad, coarsely crenulate; mesopleuron smooth and shiny above sternaulus, below sternaulus distinctly reticulate-rugose.

Legs: Fore tibial spur as long as basitarsus; hind tibia expanded at apex, 2.9 times as wide as at base; hind tibia and tarsus with brown spines among pilosity; inner hind tibial spur 1.6 times as long as outer spur, 0.75 times as long as basitarsus; hind basitarsus moderately compressed with flattened dorsal ridge at base; tarsal claws pectinate, hind claw with nine brown teeth.

Wings: Fore wing (Fig. 13) with dense pilosity, much thicker towards apex; stigma 3.7 times as long as wide; 2r 0.46 times inside height of second submarginal cell, arising 0.62 times length along stigma; Rs bent at basal 0.15, then nearly straight to

apex; second submarginal cell 2.9 times as long as wide; 2+3-SR slightly arched near 2-M; 1-SR+M 3.0 times as long as m-cu; 2-SR+M 1.3 times as long as m-cu; 1-M straight; m-cu 0.5 times as long as 1-M; 1-M 0.67 times as long as 1-SR+M; discal cell 1.5 times as long as wide; 2cu-a represented by pigmented area; 1a present, spectral in apical two-thirds; 1-2A+3A spectral, reaching to 1a; 1-CUa 0.46 times as long as 1-CUb; hind wing with six evenly spaced hamuli; 2-1A and 2A absent; 1-SRa shortly present.

Metasoma: T1 short, widened apically, as long as broad, stem 0.3 times as long as bulb, tergite beside stem finely longitudinally striate, bulb largely smooth, but basally rugulose, medio-longitudinally concave (Fig. 14); suture between T2 and T3 represented by well-defined groove; median field of T2 0.32 times as long as wide; T2 punctulate; ovipositor sheaths broad and long, 0.48 times as long as hind tibia, 0.34 times as broad as long, densely hairy along length, broadening to and rounded at apex with dorsal notch; hypopygium with moderately dense hair laterally, hairless at apex, rounded and acutely angled at apex, evenly sclerotized except for medio-longitudinally less sclerotized and folded inwards.

Color: Black; palpi, fore tibia, tarsus and apex of femur, middle tarsus and basal $\frac{1}{5}$ of middle tibia, basal $\frac{1}{5}$ of hind tibia brownish yellow to orange, first tergite except for stem and bulb dark red; wing membrane brown, much paler basally, stigma and veins dark brown.

Male.—Unknown.

Material examined.—Holotype ♀, China: Zhejiang, Suichang, Mt. Jiulong, 1994.viii.18, Chen Xuexin, No.944703.

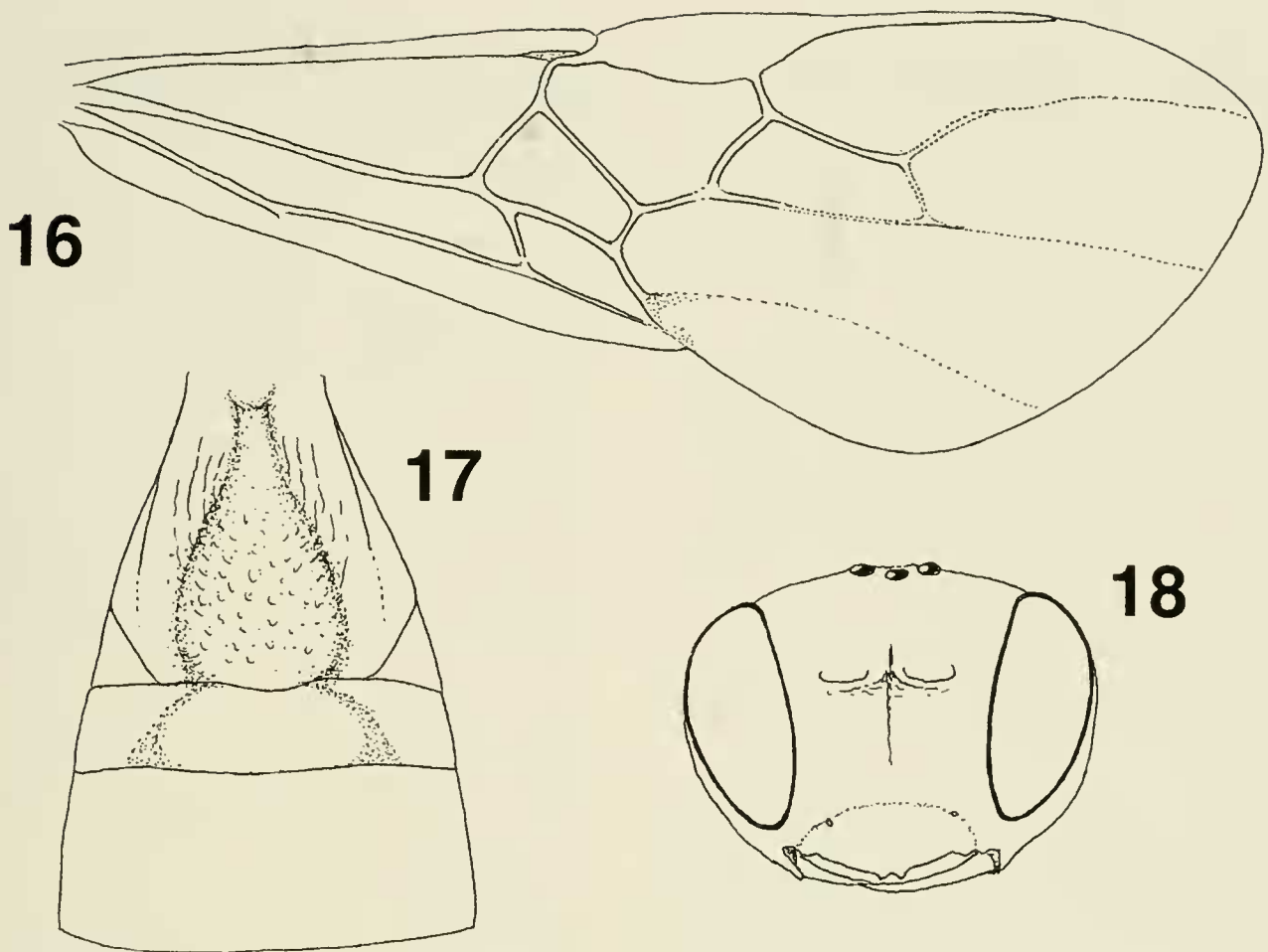
Note.—This new species is similar to *E. shezu*, but can be separated from the latter by the indistinct clypeal tubercles; medio-longitudinal carina on face much less distinct; wing membrane much less brownish, hind claw with nine teeth, hind wing with six evenly spaced hamuli; and antenna with 41 segments.

Etymology.—This species is named after the mountain where the holotype was collected. The Chinese word “Jiulong” means nine dragons. There is an old legend about this mountain. Ancient Chinese people believed that there were once nine dragons living in the mountain before people lived nearby.

Eurycardiochiles shezu Chen,
Whitfield, and He, new species
(Figs. 16–18)

Female.—Body length 7.9 mm, fore wing length 7.9 mm. *Head*: Eyes with dense fine pilosity; head sculptured with moderately dense long pilosity; labio-maxillary complex just visible below mandible; malar suture present; epistomal suture visible; clypeal margin convex laterally, with straight medio-lateral part and convex medial part with two small tubercles (Fig. 18); clypeus broad, convex and distinctly rugose, 2.3 times as broad as high; face 1.5 times as broad as high, coarsely transversely rugose, with a distinct medio-longitudinal carina; frons transversely striate, with a medial carina reaching to anterior ocellus; vertex not raised behind ocelli, narrow, coarsely transversely striate; depth of occiput in dorsal view 0.47 times length of head; length of eye 1.2 times length of temple in dorsal view; POL:OD:OOL = 8:6:18; antenna with 46 segments, short, thick, scape 1.9 times as long as broad; antennal sockets separated by 0.8 times width of antennal socket.

Mesosoma: Side of pronotum coarsely longitudinally striate ventrally, dorso-medial longitudinal furrow coarsely crenulate, rest striate; notauli present, deep, crenulate, of even width, meeting posteriorly; scutum distinctly rugose, a medio-longitudinal carina present in medio-longitudinal groove; parapsidal grooves present; scutellum with dense long pilosity, coarsely rugose, 1.4 times as broad as long, lateral carinae distinct; scutellar sulcus narrow, 3.4 times as broad as long, with four carinae; dorsellum without medial longitudinal carina; propo-



Figs 16–18. *Eurycardiochiles shezu*, holotype. 16, Fore wing. 17, First to third metasomal tergites, dorsal view. 18, Head, dorsal view.

deum short, rugose, with crenulae branching from areola; propodeal areola lens-shaped, 0.5 times as broad as long, propodeal spiracle elliptical, 2.3 times as long as broad; epicnemial carina present ventrally; sternaulus shallow, broad, coarsely crenulate; mesopleuron smooth and shiny above sternaulus, below sternaulus distinctly reticulate-rugose.

Legs: Fore tibial spur 0.89 times as long as basitarsus; hind tibia expanded at apex, 2.7 times as wide as at base, medio-longitudinally slightly concave on outer side at apical $\frac{1}{3}$; hind tibia and tarsus with brown spines among pilosity; inner hind tibial spur 1.6 times as long as outer spur, 0.65 times as long as basitarsus; hind basitarsus moderately compressed with flattened dorsal ridge at base; tarsal claws pectinate, hind claw with eight teeth.

Wings: Fore wing (Fig. 16) with dense pilosity, much thicker towards apex; stigma 3.0 times as long as wide; $2r$ 0.48 times

inside height of second submarginal cell, arising 0.63 times length along stigma; R_s bent at basal 0.23, then nearly straight to apex; second submarginal cell 2.6 times as long as wide; $2+3-SR$ slightly arched near $2-M$; $1-SR+M$ 3.3 times as long as $m-cu$; $2-SR+M$ 1.6 times as long as $m-cu$; $1-M$ straight; $m-cu$ 0.40 times as long as $1-M$; $1-M$ 0.72 times as long as $1-SR+M$; discal cell 1.7 times as long as wide; $2cu-a$ presented by pigmented area; $1a$ present, spectral in apical two-thirds; $1-2A+3A$ spectral, reaching to $1a$; $1-CUa$ 0.42 times as long as $1-CUb$; hind wing with eight evenly spaced hamuli; $2-1A$ and $2A$ absent; $1-SRa$ present.

Metasoma: T_1 short, widened apically, as long as broad, stem 0.25 times as long as bulb, bulb distinctly punctate-rugose (Fig. 17); suture between T_2 and T_3 represented by well-defined groove; median field of T_2 0.29 times as long as wide; T_2 punctate; ovipositor sheaths broad and long.

0.48 times as long as hind tibia, 0.34 times as broad as long, densely hairy along length, broadening to and rounded at apex with dorsal notch; hypopygium with moderately dense hair laterally, hairless at apex, rounded and acutely angled at apex, evenly sclerotized except for medio-longitudinally less sclerotized and folded inwards.

Color: Black; fore tibia, tarsus and apex of femur, middle tarsus and basal $\frac{1}{3}$ of middle tibia, basal 0.6 of hind tibia brownish yellow to orange, first tergite except for stem and bulb dark red; wing membrane entirely evenly brown, stigma and veins brown to dark brown.

Male.—Body length 7.8–8.1 mm, fore wing length 8.0–8.2 mm. Antenna slender, 46 segments.

Material examined.—Holotype ♀, China: Zhejiang, Longquan, Mt. Fengyang, 1,400–1,600 m, 1982.viii.16–27, Xu Junhuan, No.826636. Paratypes: 1 ♂, China: Zhejiang, Wuyanling, 1983.viii.1, Cai Zhenbin, no.833380; 1 ♂, China: Zhejiang, Lishui, 1989.vi.27–29, Xu Deling, no.896560.

Note.—This new species is similar to *E. dongzu*, but can be separated from the latter by the larger body; shorter first tergite (as long as wide); T1 and T2 punctate; wing membrane evenly entirely brownish; hind claw with eight teeth; hind wing with eight evenly spaced hamuli; and antenna with 46 segments.

Etymology.—This species is named after one of the Chinese minorities, She Zu, who mainly live in Zhejiang, Jiangxi, Anhui and Fujian provinces.

Psilommiscus Enderlein, 1912

Psilommiscus Enderlein 1912: 98. Type species (by monotypy): *Psilommiscus sumatranus* Enderlein.

This genus was brought out of synonymy with *Cardiochiles s. l.* as the sister group of *Hansonia* Dangerfield based on the phylogenetic analysis of Dangerfield et al. (1999). Mercado and Wharton (2003) cast doubt upon the sister-group relationship

with *Hansonia*, so currently the relationships of this genus are uncertain. It shares with *Hansonia* the presence of two clypeal tubercles and the reduction of eye setae, but can be separated from the latter by the presence of the occipital carina in the malar region, the apical scutellum with a cup-shaped medial pit, Rs curved in the fore wing, and the broad form of T1 and T3, which are laterally compressed and elongate in *Hansonia*. The genus is known only from the type species, *P. sumatranus* Enderlein in Sumatra, and three undescribed species from Brunei, Peninsula Malaysia, and eastern Malaysia (Dangerfield et al. 1999).

This genus is reported here for the first time in China and the type species is recorded below from the northeastern part of the Oriental Region in China.

Psilommiscus sumatranus Enderlein

Psilommiscus sumatranus Enderlein 1912: 98.

Material examined.—1 ♀, China: Fujian, Shaowu, 1945.x.1, Zhou Xiufu (= Chao Hsiufu); 1 ♀, China: Fujian, Guadun, 1963.vii.12, Chen Jiahua.

Distribution.—China (Fujian); Sumatra.

Note.—This species is new to China.

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